

Rotary tool for threaded fasteners — Hydraulic impulse tools — Performance test method

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National foreword

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Summary of pages

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 17104 was prepared by Technical Committee ISO/TC 118, *Compressors and pneumatic tools, machines and equipment*, Subcommittee SC 3, *Pneumatic tools and machines*.

Introduction

The test method specified in this Technical Specification is designed to measure the overall performance and capability of hydraulic impulse tools.

This ISO/Technical Specification is intended to give users of impulse tools a means for measuring and comparing the performance of hydraulic impulse tools under controlled conditions.

Every effort has been made to specify all critical characteristics of the test fixtures conforming to this Technical Specification. However, test results from different test fixtures can be affected by differences in dynamic characteristics, thereby making direct comparisons difficult.

The ISO/TS can be used for comparing the torque capabilities of impulse tools. It has not so far been possible to achieve acceptable reproducibility of the correlated torque scatter and it is hoped that data accumulated through experience of using the ISO/TS enables improvements to be made when it is reviewed three years after publication. In the meantime, when comparing the performances of different tools, quoted differences in correlated torque scatter (as a percentage of mean correlated torque) of fewer than ten percentage points should be viewed with caution/treated as insignificant, until verified by the potential user or purchaser of the tools.

Rotary tool for threaded fasteners — Hydraulic impulse tools — Performance test method

1 Scope

This Technical Specification specifies a laboratory performance test method for hydraulic impulse tools for installing threaded fasteners. It gives instructions on the procedure, performance parameters to test and how to evaluate and present the test data.

Justification for the test method is found in Annex A.

The test method is not intended as a routine in-plant inspection method.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2787, *Rotary and percussive pneumatic tools — Performance tests*

ISO 5393, *Rotary tools for threaded fasteners — Performance test method*

3 Terms, definitions and symbols

For the purposes of this document, the following terms, definitions and symbols apply.

3.1

hydraulic impulse tool

powered assembly tool for tightening threaded fasteners, which applies torque to a fastener in discontinuous increments through a hydraulic impulse unit

3.1.1

automatic shut-off tool

powered assembly tool for tightening threaded fasteners, which is provided with a control mechanism or system that shuts off or disconnects the power to the motor when a predetermined output level is attained

3.1.2

non shut-off tool

powered assembly tool for tightening threaded fasteners, which continues to apply torque impulses as long as the throttle remains in the “on” position

3.2

standard deviation

s

measure of the dispersion (scatter) based on the mean-squared deviation from the arithmetic mean derived from a sample of a statistical population

3.3
six sigma

$6s$
range of probability, plus and minus three standard deviations from the mean, derived from a sample of a statistical population

NOTE For a normally distributed statistical population, 99,73 % of all members of that population are encompassed.

3.4
diameter

D
nominal diameter of a bolt

NOTE The diameter is expressed in millimetres.

3.5
angle
measure of the angular displacement through which a fastener is turned

NOTE The angle is expressed in degrees.

3.6
clamp force

F_C
result of the force achieved by turning a bolt in the tightening direction after the bolt head makes contact with the joint bearing surface

NOTE The clamp force is expressed in newtons.

3.6.1
peak clamp force

F_{CP}
peak value of the clamp force measured during a tightening cycle

NOTE The peak clamp force is expressed in newtons.

3.6.2
target clamp force

F_{CT}
clamp force required to achieve the test torque when testing a hydraulic impulse tool on a test joint based on Equation (1):

$$F_{CT} = T_T / (\bar{K} \times D) \quad (1)$$

where T_T is defined in 3.7.10, $\bar{K}$ is defined in 3.9.1, and D is defined in 3.4.

3.7
torque
product of the force turning the fastener and the perpendicular distance between the line of force and the centre of the fastener

3.7.1
dynamic torque

T_D
torque recorded during the calibration of the test joint as described in 4.2.2 and 4.2.6

NOTE 1 For test joint analysis, dynamic torque is measured with an in-line, rotary torque and angle transducer, placed between a continuous drive spindle and the socket/driver bit.

NOTE 2 Dynamic torque is expressed in newton-metres.

3.7.2**peak dynamic torque** T_{DP}

peak value of the dynamic torque recorded during a tightening cycle performed during the test joint calibration procedure described in 4.2.6

3.7.3**correlated torque** T_C

torque derived from a peak clamp force measurement based on Equation (2):

$$T_C = K \times D \times F_{CP} \quad (2)$$

where K is defined in 3.9, F_{CP} is defined in 3.6.1 and D is defined in 3.4

NOTE The correlated torque is expressed in newton-metres.

3.7.4**mean correlated torque** $\overline{T_C}$

arithmetic mean of a number of correlated torque readings on a specific joint as defined in 3.7.3

3.7.5**6s-correlated torque scatter** S_{6s}

predictable range of correlated torque over which a tool performs at a given setting using a single torque-rate joint under controlled conditions

NOTE 1 For the practical purposes of this Technical Specification, 6s correlated torque scatter of a tool is the total probable range of torque of a tool run on a single joint at the same setting of the tool torque adjustment.

NOTE 2 6s-correlated torque scatter is calculated according to 5.1.

3.7.6**6s-correlated torque scatter as a percentage of the mean correlated torque** $S_{6s,p}$

single numerical percentage value designating the correlated torque capability of a tool run on a single torque rate joint under controlled conditions

NOTE 6s-correlated torque scatter as a percentage of the mean correlated torque is calculated according to 5.1.

3.7.7**combined mean correlated torque** $\overline{T_{C\text{ comb}}}$

midpoint between the lowest and highest predictable correlated torque readings of a tool at a given setting when tested on both test joints

NOTE The combined mean correlated torque is calculated according to 5.2.

3.7.8**combined correlated torque scatter** $\Delta T_{C\text{ comb}}$

predictable range of correlated torque over which a tool performs, encompassing 99,73 % or more of all possible correlated torque readings, taken on a range of joints of varying torque rates from a defined high torque rate through a defined low torque rate

NOTE For the practical purposes of this Technical Specification, combined correlated torque scatter of a tool is the total probable range of torque of a tool run on all joints used in practice at the same setting of the tool torque adjustment. It is calculated according to 5.2.